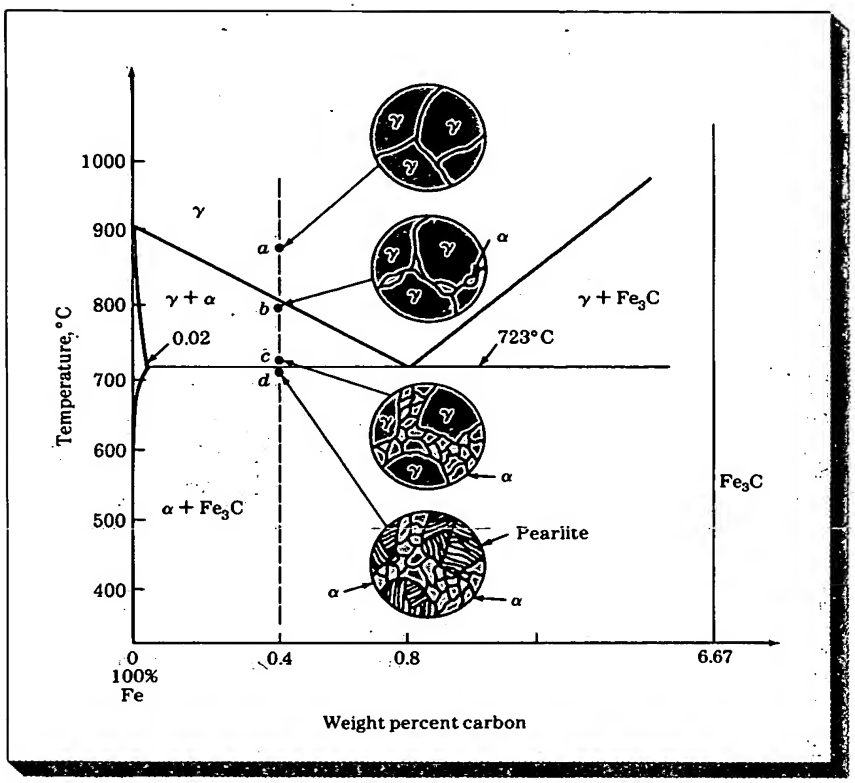

FIGURE 9.9
Transformation of a 0.4% C hypoeutectoid plain-carbon steel with slow cooling. *(After W. F. Smith, "Structure and Properties of Engineering Alloys," McGraw-Hill, 1981, p. 10.)*

sufficient time, its structure will become homogeneous austenite. Then, if this steel is slowly cooled to temperature *b* in Fig. 9.9 (about 775°C), *proeutectoid*[1] *ferrite* will nucleate and grow mostly at the austenitic grain boundaries. If this alloy is slowly cooled from temperature *b* to *c* in Fig. 9.9, the amount of proeutectoid ferrite formed will continue to increase until about 50 percent of the austenite is transformed. While the steel is cooling from *b* to *c*, the carbon content of the remaining austenite will be increased from 0.4 to 0.8%. At 723°C, if very slow cooling conditions prevail, the remaining austenite will transform isothermally into pearlite by the eutectoid reaction austenite → ferrite + cementite. The α ferrite in the pearlite is called *eutectoid ferrite* to distinguish it from the proeutectoid ferrite which forms first above 723°C. Figure 9.10 is an optical micrograph of the structure of a 0.35% C hypoeutectoid steel which was austenitized and slowly cooled to room temperature.

[1]The prefix *pro-* means "before," and thus the term *proeutectoid ferrite* is used to distinguish this constituent, which forms earlier, from eutectoid ferrite, which forms by the eutectoid reaction later in the cooling.